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ABSTRACT

Performance objectives are stated for each of the four secondary school units included in this package of instructional guides prepared for the Dade County Florida Quinmester Program. All four units are concerned with aspects of environmental concern: "Pollution," "Does It Have to be a Dirty World?," "Environmental Crises," and "Fundamentals of Ecology." Lists of state-adopted and other texts, of films and filmstrips available in Dade County, and of possible speakers from the county are included. A course outline summarizing the content of the units, numerous suggestions for experiments and activities in laboratory and field, lists of possible individual projects and, in some cases, suggested discussion questions are included. A master sheet showing the relationship of each suggested activity to the objectives of the package is appended to each booklet. (AL)

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AUTHORIZED COURSE OF INSTRUCTION FOR THE QUINMESTER PROGRAM

DADE COUNTY PUBLIC SCHOOLS

Science: POLLUTION 5343.13
5311.38
5312.38
5313.38

(Experimental)

DIVISION OF INSTRUCTION • 1971

POLLUTION

5343.13
5311.38
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SCIENCE

(Experimental)

Written by Charlotta B. Mary

for the

DIVISION OF INSTRUCTION
Dade County Public Schools
Miami, Fla.
1971

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Dade County Public Schools
Miami, Florida 33132

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TABLE OF CONTENTS

	Page
Course Description	1
Enrollment Guidelines	1
State Adopted and Other Texts	1
Performance Objectives	2
Course Outline	3
Experiments and Activities	5
Field Study Experiments	9
Projects	10
Field Trips	11
Speakers	12
Films	13
Film Strips	14
References	15
Master Sheet	17

POLLUTION
"This Dirty Old World!"

COURSE DESCRIPTION:

A study of the detection and correction of air, water and soil pollution with emphasis for current and future problems of South Florida.

Enrollment Guidelines:

This course is elective and suggested for junior high and/or non-college bound students. It also is strongly recommended for college bound students who plan to continue in this area.

Courses to be taken concurrently might include "A Study of the Hydrosphere," and "Geology."

State Adopted and Other Texts:

*1. Biological Sciences Curriculum Study, High School Biology, Green Version. Chicago: Rand McNally & Co., 1963.

2. Friends of the Earth, The Environmental Handbook. New York: Ballantine Books, Inc. 1970.

3. The Sierra Club Handbook, Ecotactics. New York: Pocket Books, 1970.

4. McCluney, The Environmental Destruction of South Florida. Coral Gables, Florida: University of Miami Press, 1971.

5. National Tuberculosis and Respiratory Disease Association, Air Pollution Primer. New York: 1969.

6. National Wildlife Federation, National E Q Index. Washington, D. C.: 1970.

*State adopted

PERFORMANCE OBJECTIVES

1. The student will devise methods for the detection of pollution in the lithosphere, hydrosphere and atmosphere of the Earth.

2. The student will specify the limitations of the Air and Water Standards as set up by Federal, State and Local governments.

3. The student will trace the pathway of a broad spectrum insecticide.

4. The student will describe the effects of hard pesticides. on the animal kingdom.

5. The student will explain the prediction of Malthus by drawing a line graph approximating the human population of the earth from the time of Aknaton (circa 1400 B.C.) to the present.

6. The student will match the following terms with their definitions or examples: (1) radioactivity; (2) strontium-90; (3) fallout; (4) half-life; (5) rad; (6) curie; (7) roentgen; (8) beta radiation; (9) gamma radiation; (10) alpha radiation; (11) plasma; (12) nuclear fission; (13) nuclear fusion; (14) atomic energy.

7. The student will list the advantages and dangers from the use of nuclear energy for the following purposes: (1) to dig harbors and canals; (2) to produce underground cracks to release gas and oil; (3) to produce cavities for underground storage of gas or water or polluted effluents; (4) to produce electrical power.

8. The student will record the evidence of man's effect upon a natural landscape.

9. Given a prescribed plant-animal community such as the Everglades, with temperature and rainfall described, the student will predict changes which would occur after burning, draining or other changing land-use patterns.

10. The student will propose reasons against the use of "hard" pesticides.

11. The student will propose reasons for evaluating a practice concerning treatment of natural or man-made environment in terms of its short and long-term advantages and disadvantages.

12. The student will demonstrate his understanding of the relationship between transportation methods and environmental contamination by writing an essay in which he evaluates the problem critically.

COURSE OUTLINE

I. Detection of Pollution

A. Air

B. Water

C. Soil

D. Space

E. Thermal

F. Noise

G. Pesticide/Herbicide

H. Nuclear

I. Population

II. Correction of Pollution

A. Outfalls along the coast

B. The sad Miami River

C. Salt water intrusion

1. The aquifers

2. Drainage of the Everglades

3. Destruction of the Big Cypress area

D. Fresh Water Resources

1. Conservation holding areas

2. Lakes

a) Okeechobee

b) Apopka

c) Others

III. Outlook and Action

A. Anti-Pollution Legislation

1. Existing ordinances
2. New laws

B. Conservation of All Natural Resources
1. Water resources
2. Wildlife
3. National and state parks
4. Open spaces
5. Mineral resources
6. Others

C. Activist's Check List
1. Solid waste disposal
2. Recycling and salvage
3. Population stabilization
4. Urban planning
5. Positive clean-up practices
6. Packaging
7. Covenant of ecological rights
   a) Balanced ecology
   b) Science and society

EXPERIMENTS AND ACTIVITIES

1. Conduct estuarine surveys to determine the effects of the following; (1) elevated water temperature; (2) large-scale drainage; (3) dredging; (4) filling-in; (5) discharge of human wastes; (6) discharge of industrial wastes; (7) pesticides; (8) herbicides.

2. Draw up a research design for a comprehensive water quality survey of each of the following water resources: (1) the Miami River; (2) Lake Okeechobee; (3) Everglades National Park; (4) the Conservation Water-Holding Areas One, Two and Three.

3. Measure the decibel levels on a downtown city street, a popular beach area, a suburban residential development, a construction site and at Miami International Airport.

4. Contrast the appearance, sound or smell of polluted, mismanaged, exploited air, water or land with that of natural conditions.

5. Investigate the reuse or recycling of the following materials as a means of solving many of the environmental problems: (1) solid wastes; (2) paper and cardboard; (3) garbage; (4) glass; (5) metal containers of all kinds; (6) automobile tires; (7) old vehicles; (8) scrap metals.

6. Using encyclopedias and/or other resources, diagram the nitrogen cycle, and either the calcium, phosphorous or carbon cycles as found in the environmental setting.

7. Diagram the formation of an inversion layer using a sequence of three pictures labeling air masses, temperatures and wind direction.

8. Describe the effect of the inversion layer on the weather in South Florida on each of the following occasions: (1) an early morning in March; (2) early evening in December; (3) high noon in July; (4) 8 A. M. in September.

9. Link the "greenhouse effect" to bumber-to-bumper vehicular traffic on the highways of South Florida.

10. Mark the location on a map of South Florida the areas which would be flooded if the ice caps at the Poles were to melt.

11. Give an argument for each of the following approaches to threat of world famine, one against, and then give evaluation of its value and its chance of being put

into operation: (1) farming the sea; (2) clearing and farming all the Everglades; (3) irrigation of South Florida's arid lands by desalted sea water; (4) sending excess people off to colonize planets; (5) leave it to natural forces; (6) voluntary family size planning; (7) compulsory family-size limitation by the Federal Government; (8) increasing yield of crops on existing lands through new varieties; (9) use of increased fertilizer and pesticides to produce increased yields of crops; (10) take care of our own country and not be concerned with any other.

12. Given a list of multiple-choice questions, have the student choose answers which outline the effects on marine and estuarine flora and fauna when hot water flows from a power plant in their vicinity.

13. Compare the problems (economic, physical, and biological) caused by various methods of cooling the water from the above installation, and determine which alternative should be used.

14. Apply to the South Florida area methods for regional planning by evaluation of conservation, industrial and residential use suitabilities, as used by Ian McHarg, Design With Nature. Garden City, New York: Natural History Press, 1969.

15. Given a newspaper article referring to an alleged environmental danger, identify the following items if they exist: (1) danger being pointed out; (2) alleged cause; (3) effect; (4) proposed solution; (5) name and qualifications of person making statement; (6) possibilities of vested interest or personal gain of author; (7) economic, social or military obstacles standing in way of proposed solution; (8) facts; (9) opinions.

16. Match descriptions of individuals or groups, or paragraphs summarizing attitudes, with philosophies such as the following:
    (1) economic gain justifies any means to get it;
    (2) conservation should either be done by the government--or if I do anything I should be paid for it;
    (3) wilderness areas should be left completely undisturbed, for their own sake and for recreation of those willing to walk into those areas--no planes, no motors;
    (4) resources should be developed for the greatest immediate production of needed raw materials, agriculture, etc.;
    (5) land should be managed for multiple-use: wildlife,

recreation, economic production, water retention, etc., --all balanced on all public lands;

(6) Smokey the Bear: keep all fires out if possible; fire is always harmful to natural values;

(7) allow no hunting; let the wildlife multiply normally in balance;

(8) kill off predators so wild game can increase for hunters;

(9) fertilize, poison, dam--simplify the environment and the agricultural methods, for large acreages of single crops;

(10) develop public lands for intensive camping, hunting, fishing and try to get the lands used as much as possible; the quality of your land-use program is best shown by beating attendance records every year.

(11) the private landowner has an obligation to improve the quality of the land he owns, and pass it on to future owners in better shape than he received it;

(12) there is no such thing as a landowner--man is a temporary controller of land, and he pays other men for this privilege, but all the land belongs to the entire earth and its life first, and to all society second; the benefits of life on the earth and of society in general take precedence over what an individual may want to do to "his" land--if his land-plans would harm resources beyond his property, or would make long-term harmful changes to the property beyond his tenure;

(13) the healthiest community is one with the greatest variety of ways for making a living, the greatest variety of kinds of organisms.

17. Given a list of agencies, match them to a list of programs and areas of action for which they are responsible in relation to the environment.

18. Given a list of problems, match each problem to those groups most able to bring about change.

19. List five things to do to bring others to the awareness of an environmental problem.

20. Formulate and justify a personal list of the ten greatest enemies of maintaining or increasing the quality of human life in South Florida (can be attitudes, industries, processes, products or groups of people), and propose one way in which the citizen might effectively work to alleviate five of these enemies' effects.

21. Write an article concerning an environmental problem in South Florida that is suitable for publication.

Hunter and Wohlers, Air Pollution Experiments for Junior and Senior High School Science Classes. Pittsburg: Air Pollution Control Association, 1969.

22. Soiling Properties of the Air (Ex. 9, p. 27)
23. Detection and Measurement of Atmospheric Carbon Monoxide (Ex. 16, P. 55)
24. Effect of Air Pollution on Dyed Fabrics (Ex. 2, p. 9)
25. Collection of Wind-Blown Particles (Ex. 10, p. 31)
26. Orsat Analysis of a Gas Sample (Ex. 14, p. 45)
27. Temperature Inversion in a Populated Valley (Ex. 17, p. 57)
28. Effect of Ozone on Rubber (Ex. 3, p. 11)
29. Determination of Dustfall or Settleable Particulates (Ex. 11, p. 33)
30. Sulfur Dioxide Damage to White Pine (Ex. 4, p. 13)
31. Determination of Smoke Shade (Ex. 8, p. 23)
32. Effect of Air Pollution on Nylon (Ex. 1, p. 7)
33. Determination of Sulfation Properties of the Air by the Lead Peroxide Candle (Ex. 15, p. 49)
34. Collection, Identification and Counting of Ragweed Pollen (Ex. 7, p. 19)
35. Effect of Sulfur Dioxide on Vegetation (Ex. 5, p. 15)
36. Use of the Electrostatic Precipitator in Removing Particles from Gases (Ex. 12, p. 37)

FIELD STUDY EXPERIMENTS

1. Collect water samples from estuarine sources, the Miami River, canals located at strategic points, and Everglades National Park. Test these samples for acidity, carbon dioxide, dissolved oxygen, hardness and pH.

2. Using water samples collected from the above or similar sources, test these samples for the presence of detergents from domestic or industrial pollution.

3. Analyze the above water samples for the presence of nitrites--nitrites which may indicate the presence of industrial or domestic pollution.

4. Continue the collecting and testing of water samples for the presence of phosphates to detect pollution from these three main sources: (1) agricultural fertilizer run-off; (2) waste-waters, primarily of domestic origin; (3) waste-waters, primarily of industrial origin.

5. Apply tests to the water samples to establish the presence or absence of coliform bacteria which are found in the intestines of animals, humans and soil. Coliform bacteria indicate pollution by sewage or surface waters.

PROJECTS

1. Organize a "Stop Pollution" Club.

2. Choose School Bird and School Flower to be protected from extinction.

3. Construct bulletin boards containing newspaper clippings, magazine articles, and pictures that tell or suggest the ways in which man has changed the natural environment.

4. Make and display photos that show the effects of man on the natural community.

5. Make posters demonstrating the water, carbon, nitrogen and calcium cycles.

6. Construct dioramas illustrating the interrelationships of man and nature before and after the growth and development of a human community.

7. Make a bulletin board to show the food cycle which is dependent on the photosynthetic process.

8. Grow radish seeds using as variables: (1) polluted water versus fresh, sweet water; (2) polluted soil versus tested safe soil; (3) polluted air versus tested, fresh air.

9. Compile a scrapbook of clippings portraying the problems of environmental pollution and clean-up.

10. Place large displays of the endangered species of South Florida around the school and community to inform and create awareness of immediate need for protection of these life forms.

11. Contact local governmental agencies by letter to urge enforcement of existing laws and requirement of penalties for all violations of anti-pollution ordinances.

12. Make a check list of violations of anti-pollution ordinances.

13. Demonstrate new uses for waste products of farms, factories and homes of South Florida.

14. Suggest ways that common plants, animals and soils in South Florida can be used more effectively in the ecosystem for the lasting benefit of all mankind.

FIELD TRIPS

1. Turkey Point Electricity Generating Station, Florida Power and Light Company.

2. Everglades National Park.

3. Big Cypress Swamp.

4. T N T (Dade County Port Authority's Training and Transition Airport).

5. The Miami River.

6. Biscayne National Monument.

7. Shark River Valley Observation Tower, Everglades National Park.

8. Sewage Treatment Plants in and around Dade County.

9. The Flood Control District's Water-Holding Areas--1, 2, and 3.

SPEAKERS

1. Dr. Earl R. Rich, University of Miami, Population Specialist.

2. Mr. William R. McCluney, University of Miami, Ecologist.

3. Mr. James Redford, Isaac Walton League of America.

4. Arthur R. Marshall, University of Miami, Center for Urban and Environmental Studies.

5. Mrs. Polly Redford, Isaac Walton League of America.

6. Mrs. Joyce Tarnow, Co-Director, Zero Population Growth, Inc.

7. Mr. Peter Baljet, Dade County Pollution Control Officer.

8. Mr. Al Volker, Science Editor, Miami News.

9. C. Richard Tillis, State Consultant in Environmental Education.

DADE COUNTY 16 MM FILMS

1. The Enduring Wilderness
   AV #1-11015, 17 minutes, C.

2. Florida
   AV #1-04911, 10 minutes, C.

3. Wonderful World of Florida
   AV #1-12944, 15 minutes, C.

4. The Florida Alligator
   AV #1-02885, 6 minutes, C.

5. From Trees To Paper
   AV #1-11607, 13 minutes B & W.

6. Prowlers of the Everglades
   AV #1-30952, 26 minutes, C.

7. The Web of Life (part 1)
   AV #1-10202, 17 minutes, C.

8. The Web of Life (part 2)
   AV #1-11063, 15 minutes, C.

9. Geography of Your Community
   AV #1-04563, 10 minutes, C.

10. Urban Sprawl
    AV #1-1-126, 15 minutes, C.

11. Man's Problem
    AV #1-13338, 19 minutes, C.

12. Wise Use of Water Resources
    AV #1-10207, 13½ minutes, C.

13. Nature's Half Acre
    AV #1-30404, 33 minutes, C.

NATIONAL MEDICAL A V CENTER, CHAMBLEE, GA. 30005.

14. Ill Winds on a Sunny Day
15. The Third Pollution
16. This Business of Air

CAROLINA POPULATION CENTER, 407 PITTSBORO ST. CHAPEL HILL, N. C. 27514

17. Under One Roof

FILM STRIPS

1. Environmental Pollution, Set of 6 strips in color
   Ward's Natural Science Establishment, Inc.
   P. O. Box 1712
   Rochester, New York 14603

References

1. Malthus, Thomas; Huxley, Julian; and Osborn, Frederick. On Population: Three Essays. New York: Mentor Books, 1960.

2. Tinker, Jon. "Man as Epidemic." New Scientist. 44: 18-20, 1969.

3. Williamson, Francis S. "Population Pollution." Bioscience. 19: 979-983, 1969.

4. Carvalho, Jose C. "The City (1) From the Cave to Megalopolis." Impact. 19: 169-177, 1969.

5. Esquire. June, 1968. Series of articles, "Cities in Trouble." pp. 65-77.

6. Anthrop, Donald F. "Environmental Noise Pollution: A New Threat to Sanity." Bulletin of the Atomic Scientists. Man 1969, pp. 11-16.

7. Bailey, Anthony. "Noise Is a Slow Agent of Death." New York Times Magazine. 23 November, 1969, p. 46 ff.

8. Bone, Quentin and Holme, N. "Oil Pollution--Another Point of View." New Scientist. 37: 365-366, 1968.

9. Breidenbach, Andrew W. and Eldredge, Richard W. "Research and Development for Better Solid Waste Management." Bioscience. 19: 948-988, 1969.

10. Brodeur, Paul. "The Magic Mineral." New Yorker. October 12, 1968. pp. 117-165, Asbestos.

11. Bulletin of the Atomic Scientists. The June 1965 issue has a section: "Man and His Habitat: The Polluted Air." pp. 7-25.

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13. Cairns, John. "We're In Hot Water." Scientist and Citizen. October, 1968. pp. 187-198.

14. Clark. "Thermal Pollution and Aquatic Life." Scientific American. March, 1969. pp. 18-27.

15. Commoner, Barry. "Nature Unbalanced. How man interferes with the nitrogen cycle." Scientist and Citizen. January-February, 1968. pp. 9-19.

16. Edwards, C. A. "Soil Pollutants and Soil Animals." Scientific American. April, 1969. pp. 88-99.

17. Fermi, Laura. "Cars and Air Pollution." Bulletin of the Atomic Scientists. October, 1969. pp. 35-37.

18. Frost, Justin. "DDT On Balance." A series of articles on that pesticide in Environment. July-August, 1969. pp. 14-40. September, 1969. pp. 2-17, 28-31, 36-40.

19. Grinstead, Robert B. "No Deposit, No Return." Environment. November, 1969. pp. 17-23. Beer cans, plastic bags, etc., in nature.

20. Novick, Sheldon. "A New Pollution Problem;" plus two other articles on mercury poisoning. Environment. May, 1969. pp. 2-23, 43-44.

21. Peterson, Malcom H. "Environmental Contamination From Nuclear Reactors." Scientists and Citizen. November, 1965. pp. 1-11.

22. Swisher, R. D. "Detergent Enzymes: Biodegradation and Environmental Acceptability." Bioscience. 19: 1093-1094, 1969.

23. Wayman, Cooper H. "A Hard Look at Soft Detergents." Bulletin of the Atomic Scientists. April, 1965. pp. 22-25.

U. S. Department of Health, Education and Welfare. (Bulletins)

24. Air Quality Criteria for Particulate Matter: February, 1969.
25. Air Quality Criteria for Sulfur Oxides. February, 1969.
26. Report for Consultation on the Metropolitan Miami Intrastate Air Quality Control Region. March, 1970.

U. S. Department of the Interior, Federal Water Pollution Control Administration. (Bulletins)

27. The Water Quality Act of 1965.
28. Clean Water Restoration Act of 1966.

Editorial Research Reports, Washington D. C.

29. Shaffer, Helen B. Pollution Technology. No. I, Vol. I, 1971.

MASTER SHEET - POLLUTION

Objectives	Projects	Films	Film Strips	Field Trips	Experiments and Activities	Student Text	Supplementary References	Speakers	Field Studies
1	8	14, 16	1	1, 6	2, 3, 4, 22, 23	1 pp.2-21, 672	12	4	1, 2, 3, 5
2	12	12	2	5	2, 17, 24	5, 1 pp.22-50	24, 25, 26, 27, 28, 29	3	
3	4	13	3	2, 3	1, 25	2 pp.76-91 4 pp.1-4	18, 12	7	4
4	2, 6	1	4	2	1, 26	4 pp.19 6		1	4
5	3	17	5	8	3, 9, 10, 11, 27	1 pp.572-609	1, 2, 3, 19, 20, 21, 22, 23	9	3
6	13	7	6	1	16, 28	5, 6	14, 13, 21	7	5
7	9	8		1	12, 13, 20, 29	6	21, 29	2	5
8	5, 4	5, 15		1, 3, 5	6, 7, 8, 14	4, 5, 6	4, 5, 6, 7, 8, 20, 29, 15	8	
9	2, 14	2, 9, 3, 6		2, 4, 7	21, 31	4, 6	9, 14, 16, 18, 22, 23	2	
10	10	10		6, 2	32	1 pp.96, 320 4,6	18, 29	5	
11	13	4, 11		9, 8	5, 15, 18, 19, 20, 33, 34	1 Chap.13	6, 7, 8, 9, 10, 11, 15	6	
12	1, 7, 9	17			35, 36	1 Chap.11 5	29, 16, 17	4	

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AUTHORIZED COURSE OF INSTRUCTION FOR THE QUINMESTER PROGRAM

ENVIRONMENTAL CRISES

5365.04
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SCIENCE
(Experimental)

DADE COUNTY PUBLIC SCHOOLS
DIVISION OF INSTRUCTION • 1971

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SCIENCE
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Written by Fred D. Basnett
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DIVISION OF INSTRUCTION
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DADE COUNTY SCHOOL BOARD

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TABLE OF CONTENTS

	Page
Course Description	1
Enrollment Guidelines	1
State Adopted Texts	1
Performance Objectives	2
Course Outline	3
Experiments	5
Projects	6
Reports and Discussion Questions	7
Films	9
Film Strips	10
Field Trips	10
Speakers and Resource People	11
References	11
Materials List	12
Master Sheet	14

ENVIRONMENTAL CRISES

COURSE DESCRIPTION:

This course will deal with the understanding of how man has polluted his environment; how this has come to be such a crisis in recent years, what some of the specific problems that have developed are, what some methods of analyzing and interpreting specific problems are, and, most importantly, how the student can get involved in efforts to assist in correcting the pressing problems.

ENROLLMENT GUIDELINES:

This course is designed as an interest course for any student. It could be presented at any level. With some adjustment in the reading references, it could be part of the regular biology requirement for pre-college students or as an elective with no prior science required.

STATE ADOPTED TEXTS

The nature of this course demands considerable supplemental reference materials. There is no text book available for the suggested emphasis. The state adopted texts listed below may be used in varying degrees depending on the availability of other references.

1. Biological Sciences Curriculum Study Committee. Biological Science: An Inquiry Into Life. 2nd. ed. New York: Harcourt Brace and World, 1968.

2. Biological Sciences Curriculum Study Committee. Biological Science: Molecules to Man. 2nd. ed. Boston: Houghton Mifflin Company, 1968.

3. Biological Sciences Curriculum Study Committee. High School Biology: BSCS Green Version. 2nd. ed. Chicago: Rand McNally and Company, 1968.

PERFORMANCE OBJECTIVES

The student will:

1. Describe various environmental conditions of air, land and water that enable him to exist on the planet earth.

2. Given data from local news media over a period of two weeks, predict the coming weather and describe potential air pollution problems that could be expected.

3. Compile data on temperature and/or rainfall during a four week period of time, construct and interpret a graph using the data.

4. Describe examples of four potential air pollution problems.

5. After surveying the respiratory diseases of man, describe how one specific air pollution problem could contribute to the increase of one disease.

6. Given three different soil sample types, calculate the water holding capacity of each.

7. After reading assigned pages of "Silent Spring" by Rachel Carson, list the distribution and dangers to flora and fauna from at least three pesticides.

8. Having measured a water sample from a polluted source, analyze this sample for a pH reading to within one-half unit of measurement.

9. Distinguish between the exchange of oxygen and carbon dioxide in the processes of respiration and photosynthesis.

10. Using the scientific method and given selected samples of water, test for the presence of at least two pollutants such as phosphate and flouride.

11. Having visited a water treatment and/or sewage disposal plant, classify the steps taken, both to reclaim used water and/or to dispose of waste materials.

12. Given one basic energy food chain, predict how a particular pollution problem will interfere with an established homeostatic environment.

13. Describe the ocean as an immediate food source and state how industrial wastes interfere with at least one source.

14. List several of our natural resources according to the immediacy of their potential depletion.

15. Describe one resource and the steps that are being taken to specifically prevent its deletion.

16. Compile a list of local, state and national agencies dealing with pollution information and investigate literature and the political structure of one of these organizations.

17. Having contacted one local organization active in environmental problems, identify the actions it is taking to rectify a local pollution problem.

COURSE OUTLINE

I. The Air Around Us

A. Composition and profile

B. Forces allowing habitation
1. Radiation
2. Inso-insulation
3. "Greenhouse Effect"

C. Weather
1. World-wide climate and seasons
2. Coriolis force
a. Global circulation systems
(1) Westerlies
(2) Easterlies
(3) Jet stream
(4) Local weather patterns-national
b. Weather patterns
(1) Cloud types and formation
(2) Rainfall and temperature patterns
(3) Frontal systems
(4) Highs - lows
(5) Stationary fronts
(6) Cyclonic winds
c. Interpretation of local weather
(1) Measurement of rainfall, temperature, humidity, wind force, dew point
(2) Correlation of weather and potential pollution fallout
d. Air pollution sources, cause, effect and control
(1) Smog
(2) Radioactive debris
(3) Pesticide residue
(4) Industry and incineration
(5) Hydrocarbon omissions

II. The Terrestrial Environment

A. Soil types and distribution

B. Water holding capacity of soils
1. Biscayne and Florida aquifers
2. Stream meandering and sedimentation

a. Problems of "canaling"
b. Man made dams and holding reservoirs

3. Vegetation related to water conservation
   a. Plant successions and distribution
   b. Timbering practices and reforestation
   c. General conservation practices
4. Terrestrial pollution sources, cause, effect and control
   a. Pesticides
   b. Fertilizers
   c. Groundwater contamination
   d. Strip mining and acid waste flow
   e. Solid waste disposal techniques
   f. Used vehicle disposal
   g. Cement and asphalt as an environmental disruption
   h. Fire

III. The Aquatic Environment

A. Limnological
   1. Chemical and physical characteristics of fresh water
   2. Open water successions, food chains and energy cycles
   3. Eutrophication and water deterioration
      a. Photosynthetic rates and "overgrowth"
      b. Animal and plant imbalance
   4. Ground water and general aquatic resources
   5. Fresh water pollution sources, cause, effect and control
      a. Water source and treatment for human consumption
      b. Sewage treatment and disposal
      c. Industrial waste and disposal
      d. Pesticide and fertilizer run-off and contamination
      e. Imbalance from unsound drainage practice

B. Marine
   1. Chemical and physical characteristics of salt water
      a. The eustuarian environment
      b. Plant and animal "blooms" and energy cycles
      c. The sea as a potential frontier and food source
   2. Marine pollution sources, cause, effect and control
      a. Thermal pollution
      b. Oil seepage and spills
      c. Industrial wastes
      d. Sea food industry and pollution problems
      e. Human waste disposal and "outfall" lines
      f. Salt intrusion
      g. Boat owners and pollution controls

IV. Environmental Summary, Involvement and Possible Correction

A. Knowledgeability
   1. Accumulation of background related to specific environmental problems
   2. Application of certain scientific procedures relevant to particular problems
   3. Interest and direction of the individual in doing something about pollution problems

4. Development of understanding of potential limits of our natural resources
5. Knowledge and interpretation of news media information and involvement with these sources

B. Involvement
1. Organizations active in anti-pollution
2. Person to person contact about pollution problems
3. Development of projects involving the individual student

EXPERIMENTS

Phillips, Edwin A. Field Ecology - A BSCS Laboratory Block. Boston: D. C. Heath and Company, 1964.

1. The Soil Factors (Ex. G, p. 27)
2. Mapping (p. 28)
3. Soil Organisms (p. 58)

BSCS, Green Version Laboratory Manual. Chicago: Rand McNally and Company, 1964.

4. Exercise 9.3 - Effects of Salinity on Living Organisms (p. 173)
5. Exercise 9.5 - Measurement of pH in Aquatic Ecosystems (p. 181)
6. Exercise 15.6 - Effects of X-irradiation Upon Seeds (p. 294)
7. Exercise 1.4 - Use of the Microscope (p. 12)

Soil Testing Kit, (Sudbury). Available from LaPine Scientific Company Catalog No. Z-08250

8. Examination of Soil for Basic Ingredients (Self-explanatory)

Lamotte Chemical Water Testing Kit. Available from LaMotte Chemical Products Co., Chestertown, Maryland. Catalog No. 5905

9. Examination of Fresh and Salt Water for Twelve Substances (Self-explanatory)

BSCS, Blue Version Laboratory Manual. New York: Houghton Mifflin Company, 1964.

10. Investigation 12 (p. 26) Acids, Bases, and pH
11. Investigation 24 (p. 52) Effects of Various Factors on the Rate of Photosynthesis.

PROJECTS

1. Develop a study of a series of weather maps and learn patterns that exist such as "highs","lows", "cold fronts", "warm fronts", temperature extremes, wind speed, dew points and other data.

2. Construct a series of graphs reflecting data from a systematic accumulation of rainfall measurement, temperature, humidity readings. Study and learn to use a barometer, rain gauge, anemometer, and dew point apparatus.

3. Make a study of the manufacture of petroleum products from crude oil to high octane gasoline. Find out which gasolines have "additives" and what they contribute to pollution. What is meant by "octane" rating?

4. Make a study of atmospheric characteristics including the changes occuring from man-made pollutants. Describe the "greenhouse" effect and particularly the light spectrum as it is broken down in penetrating the atmosphere.

5. Collect data showing the increase of respiratory diseases, the nature of each disease, the probable cause and what, if anything, is being done to reduce the incidence of each disease.

6. Make a study of soil types in your area. Collect samples of as many different types possible. Using pH paper, moisten each sample to the consistency of mud (use distilled water), and determine the pH. Why is the pH different in certain soils?

7. Survey a variety of pesticides in local stores. List the ingredients and attempt to find out which "types" may or may not be dangerous to mammals. Which types are used on a large scale for agricultural purposes? Survey nursery owners to determine what they use for their plants, the amounts used for particular plants and the number of applications per year.

8. Make a study of how septic tanks actually work. Determine what part bacteria play in reducing human waste, and how septic tanks contribute to pollution. How can epidemics of cholera and typhoid fever occur from poor sewage disposal habits?

9. Make a detailed study of specific fresh water pollution at the local, state and national levels. Discuss the sources of pollution, the means by which it gets to the fresh water, the effect on streams and lakes, the laws which are being violated, and, finally, the proposals being made to correct the situations.

10. Diagram the "workings" of a water purification plant and sewage disposal plant. Study water purification standards and the steps necessary to bring raw water up to these standards.

11. Develop a list of agencies that accumulate information on water standards, conservation practices, pollution control, legislation on pollution problems and water management. Attempt to find the processes by which standards are enforced.

12. Collect several samples of water from each side of a salt intrusion dam. Using the LaMotte testing kit, run the chloride test from these samples and record the results. If possible repeat these tests during times of dry and wet weather. Are changes evident? What is the purpose of a salt intrusion dam?

13. What are some of the methods of converting salt to fresh water? Why is it important to concentrate more and more in this field of conversion? What are some of the pollution problems caused by developing the power necessary to run conversion plants?

14. What advances have been made recently in developing power plants for production of electricity? What problems do fossil fuels pose as an air pollutant? What problems do nuclear power plants create in the environment?

REPORTS AND DISCUSSION QUESTIONS

1. Describe the "greenhouse effect". How might changes brought about by this problem change the established ecology of a given area?

2. What are the major surface wind systems on the earth? How have they been significant in the history of maritime development?

3. Survey some of the extremes of the environment in the world such as deserts, rain forests, fog zones and relate ocean and continent characteristics that have created these extremes.

4. Review certain instances of air pollution, particularly from radiation fallout; determine how it may be spread over the globe by such forces as the jet stream and basic surface wind systems.

5. Discuss "killer" smogs and the conditions that lead up to this condition. Where are smog centers located and what industries contribute most to these conditions?

6. Study some of the precipitation patterns of South Florida. What has the Flood Control District attempted to do by their series of canals and levees based on these patterns?

7. What types of spray are used by the Department of Agriculture in this region for particular insect pests? How are selective sprays developed to obtain the greatest efficiency? Why do many insects have to be sprayed more than once to be reduced in number?

8. Discuss the "accumulation" of DDT as it goes through various sequences in the food chains of nature. What legislation has occured during the past few years to eliminate DDT in its present form in certain states?

9. What success has been met throughout the world by the introduction of a foreign or competetive species to eliminate or control insect pests?

10. Describe some environmental changes that have occured in the nation and/or state by excessive use of a particular pesticide.

11. Symbiosis (living together) is a relatively common condition among certain plants and animals. Discuss some examples and, if possible, tell what might happen if pollutants created an environment that would reduce or destroy one of the symbionts.

12. Discuss the "pyramid" of numbers and the food chain relationships. At what point can pollution be most destructive to the entire cycle?

13. What is meant by population periodicity? How could air pollution, interferring with normal sunlight intensity and temperature, upset a biological established population?

14. What are some of the natural conditions occuring in the seasonal "turnover" of bodies of water that cause a rate of dissolved gas change? How could pollutants upset a normal established pattern of a water habitat?

15. List some of the pollution problems that affect your local fresh water supply. What is being done to eliminate this problem? Can polluted water be reclaimed?

16. Study information about the pulp and paper industry. How is wood grown, selected and processed? What are some of the end products? What are some of the pollution problems caused by the pulp and paper industry? What can be done towards improving reforestation techniques?

17. What is the importance of plankton to all life in the ocean? What are some of the characteristics and requirements of plankton? How could particular types of pollution actually destroy plankton as a first level food source?

18. What are some of the direct and indirect effects of oil from ships, old wrecks, offshore rigs and other sources as it washes onto the beaches of our country? Why is oil pollution of esturarian waters and tidal pools even more damaging to the overall ecology?

19. What are some specific pollution problems that affect oyster beds, crab and lobster populations, shrimping industry and general fish populations?

20. What sort of student activity could be organized to initiate anti-pollution practices at home and around our school plant?

21. What are some of the organizations in this area that directly fight sources of pollution from industry and other sources? How could you join such an organization?

22. Keep up to date on certain environmental problems by subscribing to a local or national magazine.

23. Contact one of the city officials as an individual or as part of an organized group to bring to his attention some of the environmental problesm. Find out how you could help solve these problems.

DADE COUNTY 16mm FILMS

1. Acid-Base Indicators
   AV# 1-10799, 19' C
2. Bacteria (A.I.B.S. Pt. 2 No. 8)
   AV# 1-30665, 28' BW
3. Birth of a Florida Key
   AV# 1-12252, 18' C
4. The Changing Forest
   AV# 1-11496, 19' C
5. Climate and World We Live In
   AV# 1-11007, 14'
6. Conserving Our Water Resource Today
   AV# 1-00426, 11' C
7. Conserving Our Forests Today
   AV# 1-03767, 11' C
8. Forestry
   AV# 1-11494, 20' BW
9. Law Is Made, A
   AV# 1-30048, 29' BW
10. Metric System, The
    AV# 1-00894, 11' BW
11. Population Ecology
    AV# 1-30489, 28' C
12. Radiation Biology, An Introduction to
    AV# 1-11101, 14' BW
13. River, The
    AV# 1-30760, 32' BW
14. Water and Life
    AV# 1-11054, 15' C
15. What Is Ecology?
    AV# 1-11664, 11' C
16. Restless Sea, The
    AV# 1-30371, 60' C

FILM STRIPS

1. The Great Lakes, Causes of Pollution, part II, Life Filmstrip Series
2. The Great Lakes, Causes of Pollution, part III, Life Filmstrip Series
3. Ecology of North American Deserts, #1576, Popular Science Studio-Visuals, Inc.
4. Life in Relation to Environment, A469-1, SVE Film Strips
5. Life in the Forests, A469-2, SVE Film Strips
6. Life in Two Subtropical Communities, A469-3, SVE Film Strips
7. Life on Grasslands and Prairies, A469-4, SVE Film Strips
8. Life in a Sand Dune Succession, A469-5, SVE Film Strips
9. Life in a Bog, A469-6, SVE Film Strips
10. Life in an Alpine Environment, A469-7, SVE Film Strips
11. Life in a Fallen Log Microcommunity, A469-8, SVE Film Strips
12. Life in the Oceans, F.O.M. Filmstrip of the Month Club
13. The World We Live In, part II, The Rain Forest, Life Filmstrip Series
14. The World We Live In, part III, The Face of the Land, Life Filmstrip Series
15. Forest Fires, Kinds, Causes, Cost, and Control, SVE Film Strips
16. How Man Destroys Soil, SVE Film Strips
17. Our Ocean of Air, Row Peterson and Co., Film Strip

FIELD TRIPS

1. Turkey Point - Florida Power & Light Co.
2. Water treatment plant (local)
3. Sewage treatment plant (local)
4. Dept. of Agriculture Office, 2300 N. W. 7th Ave.
5. Bear Cut Area - Ecology study
6. Everglades National Park Service - Tour Services

SPEAKERS AND RESOURCE PEOPLE

Pollution Control Office, Miami, Florida

Tropical Audubon Society

Pollution Control Consultants, 135th Street & 67th Avenue - 443-0651

Pollution Control Board, Miami, Florida

Fish Biologist, Broward County Office, Ft. Lauderdale, Florida

REFERENCES

1. Battan, Louis J. The Unclean Sky. Garden City, New York: Doubleday and Co., 1966.
2. Benton, Allen H. and Werner, William E. Principles of Field Biology and Ecology. New York: McGraw-Hill Book Co., Inc. 1964.
3. Biological Science Curriculum Study Committee. Biological Science: An Inquiry Into Life (BSCS Yellow Version) 2nd. ed. New York: Harcourt Brace and World, 1968.
4. Biological Science Curriculum Study Committee. Biological Science: Molecules to Man (BSCS Blue Version) Boston: Houghton Mifflin Company, 1963.
5. Biological Science Curriculum Study Committee. Biological Science: BSCS Green Version. Chicago: Rand McNally and Company, 1963.
6. Carr, Donald E. Death of the Sweet Waters. New York: W. W. Norton and Co., 1966.
7. Carson, Rachel. Silent Spring. Greenwich, Conn: Fawcell Publications, Inc., 1967.
8. Clarke, George L. Elements of Ecology. New York: John Wiley and Sons, Inc., 1954.
9. DeBell, Garrett. The Environmental Handbook. New York: Ballantine Books, Inc.
10. Graham, F. Since Silent Spring. New York: Fawcett Crest Books, 1970.
11. Herber, Lewis. Crisis in Our Cities. Englewood Cliffs, New Jersey: Prentice Hall, Inc., 1967.
12. Life Educational Reprints. New York: Life-Time, Inc. Current
13. Lotkowski, W. M. The Soil. Chicago: Educational Media, 1966.
14. Malletter, Althouse and Clagett. Biochemistry of Plants and Animals. New York: John Wiley and Sons, Inc., 1960.
15. Odum, Eugene P. Fundamentals of Ecology. Philadelphia and London: W. B. Saunders, Co., 1961.
16. Palmer, E. Laurence. Fieldbook of Mammals. New York: E. P. Dutton and Co., Inc., 1957.
17. Perry, John. Our Polluted World. New York: Franklin Watt, Inc., 1967.

18. Phillips, Edwin. Field Ecology. A Laboratory Block, BSCS. Boston: D. C. Heath and Co., 1964.
19. Pramer, David. Life in the Soil. A Laboratory Block, BSCS. Boston: D. C. Heath and Co., 1964.
20. Reid. Ecology of Inland Waters and Estuaries. New York: Reinhold Publishing, 1961.
21. Scientific American Offprints, San Francisco: W. H. Freeman, 1969. (Catalog)
22. Simpson, G. G. and Beck, William. LIFE. New York: Harcourt Brace and World, Inc., 1965.
23. Still, Henry. The Dirty Animal. New York: Hawthorn Books, Inc., 1967.
24. Strabler, A. N. Physical Geography, 2nd. ed. New York: John Wiley and Sons, 1959.
25. Welch, Paul. Limnological Methods. Philadelphia: The Blakiston Co., 1948.
26. "U. S. Weather Report Maps". Environmental Science Service Administration, Silver Springs, Maryland, 1970. (Current)
27. LaMotte Chemical Instruction Manual, Educational Products Division, Chestertown, Maryland. (Current)

MATERIALS AND RESOURCE LIST

1. Class set - U. S. Department of Commerce Weather Bureau Immediate U. S. Weather Report.
2. Global chart showing air and weather circulation systems.
3. Blank weather maps (100) Welch Scientific Co., Skokie, Ill., Cat. #1305.
4. Rain gauge.
5. Aneroid barometer.
6. Dew point apparatus.
7. Wet-dry bulb thermometer.
8. Triple beam balances (6).
9. Filter paper (variety)
10. Water proof dixie cups (cone shape - nematod traps).
11. pH indicator paper (12 rolls)
12. Soil types and distribution maps (Florida Department of Agriculture).
13. Charts of Reforestation Techniques (Pulp and Paper Co.)
14. LaMotte Chemical Water Analysis Kit (Chestertown, Maryland, $100.00).
15. Sudbury Soil Testing Kit.
16. Sterile Petri Dishes (100).
17. E. M. B. Agar, ¼ pound.
18. Transfer needles, 10.
19. Seins and plankton tow net - variety (optional)
20. *How To Know the Protista, T. L. Jahn (5-10)
21. *A Guide to the Study of Fresh Water Biology, Needham and Needham (5-10)
22. *The Environmental Handbook, Garrett DeBell (class set)

* Check reference page for complete information.

23. *Fundamentals of Ecology, Odum (5)
24. *Principles of Microbiology, Carte and Smith
25. Environmental Destruction of South Florida, A Handbook for Citizens, McCluney, Ross. University of Miami Press (in print)
26. *Physical Geography, Strabler, A. N. (3)
27. The Canopy of Air, Life Educational Reprint #37 (10)
28. Scientific American Offprints, Freeman Press (variety)

MASTER SHEET - ENVIRONMENTAL CRISES

Objectives	Experiments	Preferred Reading From Reference List	Supplementary References	Films	Filmstrips	Reports
1	1, 2, 8, 9	9 pp. 71-72 12 "The Canopy of Air"	(21) 159, 876, 823, 881, 618, 1111, 612, 1066	5, 12, 14, 15	3, 4, 5, 6, 7, 8, 9, 10, 13, 14, 17	1, 2, 3
2	11	(26) U.S. Weather Report Maps-Env. Sci. Service Administration, Silver Springs, Maryland.	(21) 823, 618	5	14, 15, 17	3, 4
3		The Miami Herald, The Miami News	(21) 5, 144, 159, 284, 612, 618, 817, 818, 847, 848, 849, 850, 852, 876, 878, 881	5, 14	14, 17	5, 6
4	6	23 pp. 135-201	(21) 144, 159, 248, 612, 618, 817, 818, 147, 848, 849, 850, 852, 876, 878, 881		4, 15, 17	5, 7, 8, 9
5	6	23 pp. 157-182	(21) 618			5, 8, 10
6	1, 3	13 pp. 113-127 19 p. 46, 135-216, 255	(21) 821, 1066, 1099, 195, 107, 109, 154, 1152, 803, 817, 852, 605, 852	4, 7, 8, 14		
7	9	7 pp. 24-43, 120-140, 10 pp. 96-128	(21) 189, 823, 1017, 1066		1, 2, 7, 14	10
8	4, 5, 9	20 p. 159	(21) 262, 8182	1, 2, 12	1, 2	12, 13, 14
9	11	5 p. 21 4 pp. 734-744 22 pp. 627-641	(21) 107, 189, 1066, 1163			14, 15
10	9	27 pp. 1-29	(21) 262, 1135		1, 2, 12	15, 17
11	4, 9, 10		(21) 262, 1135	2, 6		15, 19, 20
12	4	5 pp. 251-290	(21) 71, 75, 107, 135, 144, 195, 888, 1066, 1138, 1133, 1163	2, 6		1 , 1 , 19
13	4, 9	5 pp. 251-290	(21) 616, 1020	13, 14, 15	12	17, 18, 19
14			(21) 616, 1020 1068		1, 2, 4, 16	15, 16
15	16, 17	9 pp. 285-344		9		21, 22, 23

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AUTHORIZED COURSE OF INSTRUCTION FOR THE QUINMESTER PROGRAM

BASIC FUNDAMENTALS OF ECOLOGY

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SCIENCE
(Experimental)

DIVISION OF INSTRUCTION•1971
DADE COUNTY PUBLIC SCHOOLS

BASIC FUNDAMENTALS OF ECOLOGY

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SCIENCE
(Experimental)

Written by: Robert Climer
Bernard Ropeik

For the

DIVISION OF INSTRUCTION
Dade County Public Schools
Miami, Florida
1971

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TABLE OF CONTENTS

	Page
Course Description	1
Course Enrollment Guidelines	1
State Adopted Texts	1
Performance Objectives	2
Course Outline	4
Experiments	6
Projects	7
Speakers	7
Reports	8
Field Trips	9
Films	10
Film Loops	11
Slides	13
Filmstrips	14
Discussion Questions	15
Pamphlets	15
Resources	17
References	18
Master Sheet	19

BASIC FUNDAMENTALS OF ECOLOGY

COURSE DESCRIPTION

This course will introduce the concept of South Florida climate interacting with native plants and animals and in turn being acted upon by South Florida man in a system of balance and imbalance. The natural balance of urban expansion and population explosion in Dade County will be examined as to cause and effects. Methods for field analysis and improvement of environmental quality in the immediate community will be practiced.

COURSE ENROLLMENT GUIDELINES

The course is an elective beginning course for anyone desiring to study ecology and conservation.

STATE ADOPTED TEXTS

1. Biological Sciences Curriculum Study Committee. High School Biology: BSCS Green Version, Second Edition. Chicago: Rand McNally, 1968.

2. Biological Sciences Curriculum Study Committee. Biological Science: Molecules to Man, Blue Version, Second Edition. New York: Houghton-Mifflin, 1968.

3. Biological Sciences Curriculum Study Committee. Biological Science: An Inquiry into Life, Yellow Version, Second Edition. New York: Harcourt, Brace and World, 1968.

4. Biological Sciences Curriculum Study Committee. Patterns and Processes. New York: Holt, Rinehart and Winston, 1966.

PERFORMANCE OBJECTIVES

1. The student will be able to describe the various soil types in Florida, especially those found in Dade County.

2. The student will measure weather data over a three day period.

3. Given the assignment to plot a graph of seasonal variations from given data, the student will differentiate between those variables which cause seasonal climatic differences in the summer and in the winter.

4. The student will specify the limitations found in the distribution of indicator species of common Florida ecosystems.

5. The student will list limitations of distribution of some introduced plant species of South Florida.

6. Given a list of common South Florida species of plants, the student will select the classification category in which they most likely will be found.

7. The student will identify the variables of a food web within the area of his school.

8. The student will compare two or more different habitats in the South Florida area in terms of all their environmentally interacting factors.

9. The student will devise a method to analyze the density of animal populations within given areas.

10. Given the seasonal distribution of the numbers of a species within an area, the student will specify both a set of limitations and assumptions of related causes for the distribution.

11. Given a set of population data for Dade County, the student will plot a graph in order to predict population density in the year 2000.

12. Given the effect of overpopulation on the urban community by the year 2000, the student will formulate one hypothesis for each of the following elements which are affected because of overpopulation. The elements to be considered are medicine, food availability and space relationships.

13. The student will discuss critically the factors involved in the management of local natural resources and in the creation of disruptive influences on natural balance.

14. The student will propose reasons for the specific biochemical imbalances of the area.

15. The student will defend proposals for their cure, in terms of consumer, local, state and federal controls.

16. The student will construct a plan for a proposed urban community in South Florida in the year 2000, giving consideration to the solution of environmental problems.

17. The student will synthesize a plan for the field study of an ecological area, considering all of the interacting factors present in the area.

COURSE OUTLINE

I. The Ecology of South Florida

A. Climate
1. Location
2. Rainfall
3. Temperature
4. Soil

B. Plants
1. Native and exotic
2. Land, marsh, water
3. Economic value

C. Animals
1. Vertebrates
2. Invertebrates
3. Endangered species

D. Human influence on ecology
1. Overpopulation
2. Phosphate mining
3. Habitat destruction
4. Human indifference
a. Sewage disposal
b. Noise
c. Trash
d. Chemical misuse

II. The Balance of Nature

A. Producers, consumers, and decomposers

B. Decomposers

C. Organic and inorganic materials
1. Water
2. Phosphates
3. Nitrates
4. Other minerals

D. Human disruption of nature's balance
1. Slaughter of animals
a. Alligator
b. Birds
c. Predators
2. Introduction of exotic forms
a. Insects
b. Plants

III. Ecological Studies in Our Area

A. Problems in Dade County
   1. Sewage outfalls
   2. Trash and garbage disposal
   3. Noise
   4. Saltwater intrusion
   5. Freshwater supplies
   6. The Everglades
   7. Recreational land

B. How to improve the quality of our lives
   1. How to reverse the trend of degradation
   2. Legislation
      a. Density
      b. Antipollution
   3. Consumer pressure
   4. Support for environmental protection agencies

C. How to take an ecology field trip
   1. Safety
   2. Collection permits
   3. Clothing
   4. Collection equipment
   5. Paperwork
   6. Places to go

EXPERIMENTS

Biological Sciences Curriculum Study Committee. Biological Sciences: An Inquiry into Life (Yellow Version Lab Manual). New York: Harcourt, Brace, and World, 1960.

1. Biological Succession (36-1, p. 218)
2. Producers in an Ecosystem (37-1, p. 222)
3. Consumers in an Ecosystem (37-2, p. 227)

Otto, Towle, Crider. Biology Investigations. New York: Holt, Rinehart and Winston, 1965.

4. The Water Cycle (48-1, p. 329)
5. Nutritional Relationships (49-1, p. 333)
6. Ecological Analysis of Two Habitats (49-2, p. 337)
7. Life in Soil Communities (49-3, p. 343)
8. Succession (51-1, p. 345)

Biological Sciences Curriculum Study Committee. High School Biology Laboratory Manual (Green Version, Second Edition). Chicago: Rand McNally, 1968.

9. Food Webs (29-1, p. 129)

Green and Bolkowsky. Laboratory Investigations in Biology. Morristown, New Jersey: Silver Burdett, 1971.

10. Population Changes (No. 51, p. 221)
11. A Survey of a Biotic Community (No. 52, p. 225)
12. Interspecific Relationships-Symbiosis (No. 55, p. 239)
13. The Effects of Salinity Changes on Populations (No. 58, p. 249)

Biological Sciences Curriculum Study Committee. High School Biology (Green Version, Second Edition). Chicago: Rand McNally, 1968.

14. Population Changes in Open Systems (2.3, p. 62)
15. The Study of a Biotic Community (3.1, p. 76)
16. Abiotic Environment-A Comparative Study (3.2, p. 98)

Biological Sciences Curriculum Study Committee. Biological Sciences: An Inquiry into Life (Yellow Version, Second Edition).

17. A Plant Community (39-1, p. 267)
18. An Animal Community (39-2, p. 271)
19. Ecological Succession (39-3, p. 275)

PROJECTS

1. Prepare a graph that will show the temperature-rainfall weather pattern over a period of six weeks.

2. Have students make a comparative study of the chemical effects of pesticides used in South Florida. Project should include what chemicals are used most and their chemical effects on various species. Include people in this study.

3. Make an analysis of the oxygen requirements of 3 different animals inhabiting South Florida canals. Select animals that are top dwellers, middle level dwellers, and bottom dwellers.

4. Make a study on various types and kinds of organisms that make up a food web in an open sawgrass area. The study should include the effects of the atmosphere and chemical residues.

SPEAKERS

1. American Institute of Industrial Engineers, Inc., Col. R. B. Levin - Standard Chemical Co., P. O. Box 667, N. W. Station, Miami, Florida.

2. Central and South Florida Flood Control District, Mr. Cliff Head - P. O. Box 1671, West Palm Beach, Florida 33042.

3. City of Miami Water Plants, Director of Department of Water and Sewers. Telephone: 665-7471.

4. ESSA - Dr. Harris B. Stewart, 901 S. Miami Avenue. Telephone: 350-4104.

5. Everglades National Park, Chief Naturalist, Homestead, Florida. Telephone: 247-6211.

6. Water Resources Division, U. S. Geological Survey, Box 348, Coconut Grove Station, Miami, Florida.

REPORTS

1. Have the student compare rainfall and temperature for three given months and tell how they affect our plant and animal relationships.

2. List five different types of soil found in South Florida and explain how each affects animals and plants.

3. Make a list of ten native and ten exotic plants and tell why they are of importance in an ecological study.

4. Prepare a report on ten different animals which are part of a food web.

5. What is the effect of phosphates and nitrates on the South Florida ecosystems?

6. Prepare a report on what is being done in our community about sewage disposal.

7. Many of our native animals are in danger of extinction. List some of these animals and tell what is and what can be done to save them.

8. Why is saltwater intrusion into the Everglades a severe problem?

9. Research the short and long term effect of phosphate mining on the Everglades National Park.

10. Why is overpopulation a serious problem in the overall ecology?

FIELD TRIPS

1. W. Orr Water Treatment Plant, 6000 S.W. 87 Avenue, Miami, Florida.

2. Local Sewage Disposal Plants.

3. Everglades National Park, Homestead, Florida.

4. Virginia Key, Rickenbacker Causeway, Miami, Florida.

5. Bear Cut Estuary, Rickenbacker Causeway, Miami, Florida.

6. Miami Seaquarium, Rickenbacker Causeway, Miami, Florida.

7. Environmental Education Center, Key Biscayne, Florida.

8. U.S. Department of Agriculture, 2690 N. W. 7 Avenue, Miami, Florida.

9. Matheson Hammock Trail and Mangrove Swamps, Coral Gables, Florida.

10. University of Florida, Agricultural Research and Education Center, Institute of Food and Agricultural Science, formerly Sub-tropical Experiment Station, 18905 S. W. 280 Street, Homestead, Florida.

FILMS

Available from Dade County Audio-visual Services

ECOLOGY

1.	Population Ecology	28 min.	AV#1-30489
2.	Balance of Nature	20 min.	AV#1-11141
3.	Beach and Sea Animals	11 min.	AV#1-02664
4.	What is Ecology?	11 min.	AV#1-11064
5.	Water Birds	32 min.	AV#1-30705
6.	Water Birds	11 min.	AV#1-02995

HABITAT

7.	Nitrogen Cycle	14 min.	AV#1-11093
8.	Prowlers of the Everglades	26 min.	AV#1-30952
9.	Flowering Desert	11 min.	AV#1-02347
10.	Forest Grows	10 min.	AV#1-03740
11.	The Pond	9 min.	AV#1-04126
12.	Life in a Drop of Water	10 min.	AV#1-02719

CHANGES IN ENVIRONMENTS

13.	Succession From Sand Dune to Forest	10 min.	AV#1-11108
14.	The Web of Life, Part I	17 min.	AV#1-10202
	Part II	16 min.	AV#1-11063

BIOGEOGRAPHY

15.	Birth of the Soil	10 min.	AV#1-03696
16.	Birth of a Florida Key	18 min.	AV#1-12252
17.	Between the Tides	20 min.	AV#1-11071
18.	Life in the Desert	11 min.	AV#1-02393
19.	Life in the Forrest	11 min.	AV#1-03755
20.	Life in the Grassland	11 min.	AV#1-02217
21.	Life in the Ocean	18 min.	AV#1-11043

SOIL AND WATER CONSERVATION

22.	Life Along the Water Way	11 min.	AV#1-02790
23.	Marine Animals of the Open Coast	22 min.	AV#1-11075

ECOLOGY FILM LOOPS

Available from: Ealing-Films, 2225 Massachusetts Avenue, Cambridge, Massachusetts 02140.

ECOLOGY

1.	89-1622	Adaptation to Environment (set)	91.80
2.	89-3149	Habitats (set)	91.80
3.	89-5201	Marine Ecology (set)	137.70
4.	89-2778	Plankton: The Living Sea (set)	137.70
5.	89-6520	A Fresh Water Algal Bloom	22.95
6.	81-9128	Amazon Jungle	22.95
7.	81-3360	Animal Camouflage Insects	22.95
8.	81-3238	Animal Partnerships: Coral Reef Species	22.95
9.	81-3055	Aphid and Its Enemies: Part I	22.95
10.	81-3063	Aphid and Its Enemies: Part II	22.95
11.	81-9706	Carnivorous Plants	22.95
12.	81-6827	Collecting Plankton	22.95
13.	81-8567	Desert Plants	22.95
14.	81-6553	Diatoms in a Food Web	22.95
15.	81-3071	Escape in Mammals	22.95
16.	81-6017	Flagellar Locomotion in Termite Symbionts	22.95
17.	81-5852	Grass Bottom Environment	22.95
18.	81-3345	Horntail Wasp: Part 2 - Primary Parasite	22.95
19.	81-3352	Horntail Wasp: Part 3 - Thief Parasite	22.95
20.	81-3451	How Spiders Capture Prey: Spiders with Webs	22.95
21.	81-3469	How Spiders Capture Prey: Spiders without Webs	22.95
22.	81-3204	Introduction to the Coral Reef	22.95
23.	81-6546	Killing Weeds with 2, 4-D	22.95
24.	81-9193	Life on an Arctic Island	22.95
25.	81-3246	Marine Predators: Competition for Food	22.95
26.	81-6538	Oxygen Levels During an Algal Bloom	22.95
27.	81-5795	Parasitism: Argulus on the Stickleback	22.95
28.	81-5795	Plankton: Adult Forms	22.95
29.	81-6835	Plankton: Diversity	22.95
30.	81-6843	Plankton: Mobility	22.95
31.	81-6561	Prairie Seasons	22.95
32.	81-5860	Rock Bottom Environment	22.95
33.	81-5845	Rock Shore Environment	22.95
34.	81-5878	Sand Bottom Environment	22.95
35.	81-5837	Sand Shore Environment	22.95
36.	81-3253	Territorial Behavior: Fish	22.95
37.	81-5886	Under Rock Environment	22.95

SUPER-8 SINGLE-TOPIC FILM LOOPS

Available from: Wards Natural Science Establishment, Rochester, New York:

MARINE ENVIRONMENTS

1. The Rocky Coast I (High-tide zone) 19.95
   73 W 1852 (T) 73 W 2101 (K)

2. The Rocky Coast II (Mid-zone) 19.95
   73 W 1853 (T) 73 W 2102 (K)

3. The Rocky Coast III (Low-tide zone) 19.95
   73 W 1854 (T) 73 W 2103 (K)

4. The Sandy Beach Environment 19.95
   73 W 1855 (T) 73 W 2104 (K)

5. The Mud Flat Environment 19.95
   73 W 1856 (T) 73 W 2105 (K)

6. Identification of Marine Organisms 19.95
   73 W 1857 (T) 73 W 2106 (K)

FRESH WATER ENVIRONMENTS

1. The Pond Environment I (Plankton) 19.95
   73 W 1869 (T) 73 W 2131 (K)

2. The Pond Environment II (Organisms Inhabiting Aquatic Vegetation) 19.95
   73 W 1870 (T) 73 W 2132 (K)

3. The Pond Environment III (Organism Using the Surface Film) 19.95
   73 W 1871 (T) 73 W 2133 (K)

4. The Pond Environment IV (Bottom Inhabitats) 19.95
   73 W 1872 (T) 73 W 2134 (K)

5. The Stream Environment I (Aquatic Insects, Part I) 19.95
   73 W 1873 (T) 73 W 2135 (K)

6. The Stream Environment II (Aquatic Insects, Part II) 19.95
   73 W 1874 (T) 73 W 2136 (K)

7. The Stream Environment III (Aquatic Insects, Part III) 19.95
   73 W 1875 (T) 73 W 2137

8. Identification of Fresh Water Organisms 19.95
   (test film) 4 min.
   73 W 1876 (T) 73 W 2138

SLIDES

Available from Dade County Audio-visual Services

1.	Florida Birds and Wildflowers 52 2X2 Color slides; 1 Study Guide	5-70017
2.	Everglades National Park 14 2X2 Color slides	5-20095
3.	Field Trip to Miami City Water Plant 32 2X2 Color slides	5-20089
4.	Fish 28 2X2 Color slides	5-20073
5.	Plants and Trees 32 2X2 Color slides	5-20046
6.	Subtropical Flowering Plants (Part I) 26 2X2 Color slides	5-20074
7.	Subtropical Flowering Plants (Part II)	5-20067

MODELS

Available from Dade County Audio-visual Services

1.	Animals of the Sea, Set 1	6-00123
2.	Animals of the Sea, Set 2	6-00161
3.	Florida Bay Model	6-00152
4.	Florida Shells, Set 1	6-00121
5.	Florida Shells, Set 2	6-00052
6.	Florida Shells, Set 3	6-00159
7.	Florida Shells, Set 4	6-00001
8.	Flowers	6-00030
9.	Insects Exhibit	6-00111
10.	Marine Life	6-00087

11.	Mollusks Exhibit	6-00002
12.	Phosphates Exhibit	6-00048
13.	Poisonous Plants, Set 1	6-00105
14.	Poisonous Plants, Set 2	6-00106
15.	Poisonous Plants, Set 3	6-00170
16.	Soils of Florida	6-00032

FILMSTRIPS

Available from: Wards Natural Science Establishment, Rochester, New York.

1. MAN'S IMPACT ON HIS ENVIRONMENT

The Web of Life
Organism and Natural Environment
Man's Early Impact
Mass Production of Food (a)
Mass Production of Food (b)
The Disruptive Impact of Agri-Industry
Urban-Industrial Encroachment
The Population Explosion
Autoculture
168 W 9000 Set of 9 Filmstrips in Color 63.00

2. CHECK AND BALANCE IN NATURE

Limiting Factors
Diversity
Interaction
Succession
Survival
Man's Impact
A City Lot (a)
A City Lot (b)
168 W 9020 Set of 8 Filmstrips in Color 56.00

3. ENVIRONMENTAL POLLUTION: OUR WORLD IN CRISIS

Nature of the Crisis
Atmospheric Pollution
Land Pollution
Fresh Water Pollution
Marine Pollution
Pollution Control
70 W 3800 40.00

DISCUSSION QUESTIONS

1. Discuss the availability of oxygen to living organisms as it is affected by chemical pollutants.

2. Define the relationship of a food web within a marine ecosystem to external factors such as temperature and rainfall.

3. Specifically differentiate the various types of noise pollution and its effect on living organisms.

4. What local, state and federal controls are being implemented to save the South Florida ecosystems?

5. Why is the balance of nature so critical in the overall ecology?

PAMPHLETS

1. Air Pollution Primer, National Tuberculosis and Respiratory Disease Association, New York, N. Y., 1969.

2. An Accounting System for Incinerator Operations, Bureau of Solid Waste Management, Public Health Service 2032, U.S. Department of Health Education and Welfare, Washington D.C., 20402.

3. A Practical Guide to Water Quality Studies of Streams, C W.R.-5, U.S. Department of Interior, Washington, D.C., 1969.

4. A Primer on Ground Water, U.S. Government Printing Office, Washington, D.C., 20402.

5. A Primer on Water, U.S. Department of Interior, Department of Geological Survey, Washington, D.C., 20402, 1970.

6. A Primer on Water Quality, U.S. Government Printing Office, Washington, D.C., 1965.

7. A Primer on Waste Water Treatment, C- WA-12, U.S. Department of Interior, Washington, D.C., Oct., 1969.

8. Aquatic Weed Control, Cir. 219-A, University of Florida, Gainesville, Florida.

9. Atmospheric Emissions from Wet Process Phosphoric Acid Manufacture, Publication No. A.P.-57, National Air Pollution Control Administration, U.S. Printing Office, Washington, D.C., 1970.

10. Botany Handbook of Florida, Florida Department of Agriculture, Tallahassee, Florida, 1965.

11. Composting Dewatered Sewage Sludge, Publication No. 1936, Public Health Service, U.S. Printing Office, Washington, D.C.

12. Conserving Our Waters and Clearing the Air, Student manual, Teachers guide, American Petroleum Institute, 1271 Avenue of the Americas, N. Y., 10020.

13. Ecology, The Environment and Man, University of Florida, Gainesville, Florida, 1970.

14. Green Survival and the Environmental Crisis, American Association of Nurserymen, 835 Southern Building, Washington, D.C., 20005.

15. Limnology, LaMotte Chemical Products Co., Chestertown, Mass., 21620.

16. Sensory Evaluation of Diesel Exhaust Odor, U.S. Department of Health Education and Welfare, National Air Pollution Control Administration, AP-60, U.S. Government Printing Office, Washington, D.C.

RESOURCES

I. Pamphlets
Available from: Dade County Department of Agriculture, 2690 N.W. 7 Avenue, Miami, Florida, or 18710 S. W. 208 Street, Homestead, Florida.

1.	Botany Handbook for Florida	Bulletin #187
2.	Common Aquatic Weeds	Ag. Handbook #352
3.	Florida Weeds	Circular #331
4.	Miscellaneous Tropical and Subtropical Plants	Bulletin 156A
5.	Native and Exotic Palms of Florida	Bulletin 152A
6.	Plants That Poison Farm Animals	Bulletin 510A

II. Golden Nature Series - Golden Press, New York, New York

1. Everglades National Park
2. Flowers
3. Non-flowering Plants
4. Pond Life
5. The Southeast
6. Trees
7. Birds
8. Insects
9. Reptiles and Amphibians
10. Mammals
11. Seashores
12. Fishes
13. Zoology
14. Gamebirds
15. Moths and Butterflies

REFERENCES

1. Carson, Rachel. The Sea Around Us, Special Edition for Young Readers. New York: Golden Press, 1958.

2. Ehrenfeld, David W. Biological Conservation. New York: Holt, Rinehart and Winston, 1970.

3. Morholt, Evelyn et al. A Source Book of the Biological Sciences. New York: Harcourt, Brace & World, 1966.

4. Morton, Julia F. Wild Plants for Survival in South Florida. Miami, Florida: Hurricane House Publisher, Inc., 1968.

5. Needham, James and Needham, Paul. A Guide to the Study of Fresh Water Biology. San Francisco: Holden-Day, Inc., 1967.

6. Odom, Eugene P. Fundamentals of Ecology. Philadelphia: W. B. Saunders and Company, 1959.

7. Reid, George K. Ecology of Inland Waters and Estuaries. New York: Reinhold Publishing Co., 1961.

8. Stevens, William. Southern Seashores. New York: Holiday House, 1968.

9. Went, Frits W. The Plants. Life Nature Library. New York: Time Life Books, 1963.

MASTER SHEET - BASIC FUNDAMENTALS OF ECOLOGY

Objectives	Student Texts	Experiments	Projects	Library Reports	Field Trips	Speakers	Discussion Questions	Films	Film Loops	Film Strips	Slides	Models
1	1-Chap. 7 pp.216-249 3-Chap. 8 pp.154-180 4-Chap. 6 pp.128-146	6 - 337 7 - 343 8 - 345	4	2	7,8,11	2, 4	1	15,16	17 I-1 I-2 I-3	1	5	16
2,3	1-Chap. 2 pp.2-35	4 - 329	1	1	8	4,5,6	4	4	17 33 35	1, 2		
4,5, 6	1-Chap. 2 pp.36-71	2 - 222 3 - 227 17 - 267 18 - 271	2	3, 4, 7	3,5,7, 10,11	5	2, 5	3,5, 11,16, 17,21, 22	2,3,5, 32,34		1,5,6, 7	1,2,8, 10,13, 14,15
7,8	1-Chap. 1 pp.2-35 2-Chap. 28 pp.597-616 3-Chap. 8 pp.154-180 Chap. 39 pp.689-706	6 - 337 8 - 345 9 - 129 10 - 221 11 - 225 12 - 239 17 - 267 18 - 271 19 - 275	4	3, 4	3,4,5, 7,9	4, 5	1, 2	2,3,8, 10,11, 12,13, 21,22	2,3,14, 22,32, 33,34, 35,36, 37	1	1,2,5, 6,7	1,2,3, 8,9, 11
9,10 11,12	1-Chap. 2 pp.36-71 2-Chap.28 pp. 597-616 3-Chap. 8 pp.154-180	10 - 221 11 - 225 12 - 239 13 - 249 14 - 62 16 - 98 19 - 275	3, 4	4, 7, 10	3,4,5, 7,10	4, 5	1,2,5	1,2, 17,21, 23	4,17,22 25,35	1,2	1,4,6, 7	1,2,4, 5,6,7, 8,10
13,14 15	1-Chap. 3 pp.72-101 1-Chap. 20 pp.741-775 2-Chap. 30 pp.641-667 3-Chap. 40 pp.707-719	11 - 225 12 - 239 15 - 76 16 - 98	2, 3	5,6,7,8, 9	1,2,8, 11	1,2,3, 4,6	1,3,4	12,13, 14	3,22, 23,25, 26	1,2,3	3,6,7	3,12, 13,14, 15
16	1-Chap. 20 pp.741-775 2-Chap. 30 pp.641-667 3-Chap. 39 pp.689-706 3-Chap. 40 pp.707-719	1 - 218 8 - 345 13 - 249 14 - 62 19 - 275	2, 3	2,4,5,8, 9, 10	1,2,3, 4,6,8, 11	1,2,4, 5,6	2,5	1,2, 13,14, 15,17, 21	1,2,3 5,8, 17,22, 26,33, 34	1,2,3	1,2,5	1,2,8, 10,13, 14,15, 16
17	1-Chap. 1 pp.2-35 1-Chap. 2 pp.36-71 2-Chap. 28 pp.597-616 3-Chap. 39 pp.674-688	1 - 218 2 - 222 3 - 227 5 - 333 15 - 76 19 - 275	4	2,3,4,5, 8,10	2,3,4, 5,9,10, 11	4,5,6,	1,2,4, 5	1,2, 13,14, 22,23	1,2,3, 5,12, 14,22, 31	1,2,3	1,4,5, 6,7	1,2,3, 4,5,6, 7,10, 11

ED 057113

AUTHORIZED COURSE OF INSTRUCTION FOR THE QUINMESTER PROGRAM

DADE COUNTY PUBLIC SCHOOLS

Science: DOES IT HAVE TO BE A DIRTY WORLD? 5314.08

DIVISION OF INSTRUCTION • 1971

DOES IT HAVE TO BE A DIRTY WORLD?

5314.08
SCIENCE

(Experimental)

Written by Helen Kickliter and Gerald Clement
for the
DIVISION OF INSTRUCTION
Dade County Public Schools
1971

DADE COUNTY SCHOOL BOARD

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65

TABLE OF CONTENTS

	Page
Course Description	1
Enrollment Guidelines	1
State Adopted Texts	1
Performance Objectives	2
Course Outline	3
Experiments	4
Demonstrations	5
Projects	6
Reports	7
Field Trips	8
Speakers	9
Related Problems	10
Films	11
Slides and Filmstrips	13
Suggested Discussion Questions	14
Additional Innovative Activities	15
References	16
Master Sheet	17

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DOES IT HAVE TO BE A DIRTY WORLD?

COURSE DESCRIPTION

This course is designed to acquaint students with the problems of environmental decay in such a way that it does not seem a hopeless problem but one about which they had better start thinking. Further, it is intended that students will develop constructive attitudes from the experiences presented.

ENROLLMENT GUIDELINES

Recommended for students whose interest and background in science is extremely limited.

STATE ADOPTED TEXTS

1. Thurber and Kilburn. Exploring Life Science. Boston: Allyn and Bacon, 1967.

2. Frazier and Smith. The Biological Sciences. River Forest, Illinois: Laidlaw Brothers, 1969.

3. Interaction Science Curriculum Project. Interaction of Man and the Biosphere, Experimental Ed. Rand McNally & Co., 1969.

4. Oxenhorn. Pathways in Science. Earth Sci. 2. New York: Globe Book Company, Inc., 1969.

5. Wong and Dolmatz. Ideas and Investigations in Science: Biology. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1971.

A "must" reference that includes many ideas and projects may be ordered free of charge from:

"Environmental Involvement"
The Dow Chemical Company
Inquiry Services
2030 Dow Center
Midland, Michigan 48640

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PERFORMANCE OBJECTIVES

1. Students will investigate how man has disturbed the cycles of his environment.

2. Given the four natural cycles, students will predict serious effects of interruption of any of these cycles.

3. Students will distinguish between services of technology and pollution by technology.

4. Given the statement, "Man must balance the services of technology against the pollution by technology," students will react by citing evidence for or against this statement.

5. Students will relate overcrowding to emotional strain.

6. Students will cite ways in which overcrowding strains the environment which supports life.

7. Students will classify their own attitudes into two categories: "Good for the Environment" or "Bad for the Environment."

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COURSE OUTLINE

I. Understanding Pollution

A. Natural cycles
1. Oxygen
2. Water
3. Carbon
4. Nitrogen

B. What man is doing to South Florida
1. Fresh water
2. Inland waterways and bays
3. Soil
4. Air

C. Technological pollution
1. Automobile
2. Industry
3. Sewerage
4. Thermal
5. Noise

D. Overcrowding as a strain
1. On the physical environment
2. On our psychology
3. On waste disposal

II. What Can We Do About It?

A. Personal decisions
1. Littering
2. Conserving water
3. Reduce demands for throw-away items
4. A clean world is a right, not just a "desire."

B. National decisions
1. We must find ways to preserve the natural cycles while doing what we need to do for a good life.
2. We must balance the services of technology against the pollution of technology - not blame technology.
3. We must live within, not outside, the natural cycles.
4. We must use the environment within the limits of the environment.

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EXPERIMENTS

Thurber & Kilburn. Exploring Life Science. Boston: Allyn & Bacon, 1967.
1. Microcosm (Exp. 3, p. 43)

Ten Years To Go! Dade County Division of Instruction Bulletin #10B-SU-7, (Experimental Ed.), 1970.
2. Effect of Noise on Gerbils (p. 132)

Interaction Science Curriculum Project. Interaction of Man and the Biosphere, Ex. Ed. Rand McNally & Co., 1969.
3. In. 11.2 - Environmental Resistance (p. 227)
4. In. 11.4 - Two Food Webs (pp. 236-238)
5. In. 11.7 - Succession on a Microscope Slide (pp. 261-262)

Needham, D. Pollution - A Teaching and Action Program.
Reprint, "Grade Teacher", Oct., 1970.

Air Pollution

6. II - G, J, K - Trapping Air Pollutants on Vaseline Cards
7. III - D - Observing Cars and Their Pollution
8. IV - A - Effect of Clogging Stomata in Leaves
9. IV - J-1 - Making Smog
10. IV - J-2 - Combining Two Materials to Form Another

Water Pollution

11. II - I - How Sewage Pollutes Water
12. II - K - Organisms in Bottom Soil of Polluted Bottom Soil
13. III - B - Effect of Chemicals in Water on Plants and Animals

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DEMONSTRATIONS

Thurber and Kilburn. Exploring Life Science. Boston: Allyn and Bacon, 1967.

1. Model of aquifer and well (pp. 446-7)

Needham. Pollution - A Teaching and Action Program. Reprint, "Grade Teacher", Oct., 1970.

Air pollution

2. II - A How Many Breaths do You Take per Minute? per Hour? per Day?
3. II - D Burning Match vs. Exhaling
4. II - E Making CO_2 Chemically
5. II - F Visible Pollutants in Classroom Air
6. III - B Burning Candle Compared to Car Engine
7. IV - I Detection of Odors in the Air

Water pollution

8. II - A Total Volume of Water vs Amount Suitable for Drinking

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PROJECTS

1. Litter Project (See Ten Years to Go! Dade County Division of Instruction Bulletin #10B-SU-7, pp. 10-11)

Thurber and Kilburn. Exploring Life Science. Boston: Allyn and Bacon, 1967.

2. Display of life facing extinction (no. 23, p. 463)
3. Estimate amount of water used in home (no. 11, p. 462)
4. Cycle charts (no. 8, p. 46)

5. Compare the number of "returnable" bottled soft drinks with the number of "no deposit/no return" soft drinks in a local store.

6. Take photographs of sources of pollution in Dade County.

7. Present a "before" section of a city and have students plan and draw improvements to make it more naturally beautiful.

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REPORTS

1. A bird or mammal that has become extinct since 1870 and one that is in current danger. Concentrate on what is known about the animal's disappearance or near disappearance.

2. The effect of introducing rabbits into Australia.

3. Changes in populations of white-tailed deer in North America, emphasizing the role of man in these changes.

4. Causes and possible effects of different kinds of "smog" that pollute the atmosphere.

5. "The Death of Lake Erie." Be sure to include what it was like before, and why the lake died.

6. The Audubon Society, why it was formed, and the kind of work it does.

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FIELD TRIPS

1. Mouth of the Miami River
2. Dade County Incinerator
3. Everglades National Park
4. City of Miami Water Supply Plant
5. Sewage Treatment Plant

SPEAKERS

1. Environmental Education Committee, Box 8236, University of Miami Branch, Coral Gables, Florida. (Wide range of speakers on all topics of pollution)

2. Dade-Monroe Tuberculosis and Respiratory Disease Association, 830 S. E. 1 Avenue. 377-2368

3. Captain Cox, Eastern Airlines. 873-6325 (Air pollution)

4. Mr. Gautz. 696-8000 (Smoking)

5. Kenneth Schang from Pollution Control Office. 635-7524

6. Roy Champagne (Agriculture Extension Agent). 635-1387

7. Ross McCluney (Population and Land Use). 667-4422

RELATED PROBLEMS

Thurber and Kilburn. Exploring Life Science. Boston: Allyn and Bacon, 1966.

1. Robin chart (p. 439)

2. Meadow mouse reproduction (p. 440)

3. Meadow mouse population per acre (p. 440)

4. Coyote as a predator (p. 440)

MANY OTHER PROBLEMS OF THIS TYPE CAN BE EFFECTIVELY WORKED INTO CLASS DISCUSSIONS OF NATURAL CONTROLS AND EFFECTS OF OVERPOPULATION.

DADE COUNTY 16mm FILMS

1.	Balance in Nature 17' C		AV#1-11141
2.	Interrelationships for Survival 28' C		AV#1-30558
3.	Natural Enemies of Insect Pests 27' C		AV#1-30703
4.	Partnerships Among Plants and Animals 11' C		AV#1-02657
5.	Pond Life 10' BW		AV#1-02726
6.	This Vital Earth 10' C		AV#1-02178
7.	Breaking the Web 11' C		AV#1-00421
8.	The Green City 23' C		AV#1-30054
9.	A Strand Grows: The Web of Life (part 1) 15' C		AV#1-11063
10.	A Strand Breaks: The Web of Life (part 2) 17' C		AV#1-10202
11.	Water for the Community 11' BW		AV#1-03585
12.	Water Supply 10' C		AV#1-03582
13.	Animal Predators and The Balance of Nature 11' C		AV#1-05650

The following must be rented or purchased from the company indicated.

14. The Everglades: Conserving a Balanced Community 11' C
Encyclopedia Britannica Education Corporation
425 North Michigan Avenue
Chicago, Illinois 60611

15. A Matter of Time 27' C
Conservation Foundation
1250 Connecticut Avenue, N.W.
Washington, D. C. 20036

16. Alone in the Midst of the Land 27' C
National Broadcasting Company - T.V.
30 Rockefeller Plaza
Room 914
New York, New York 10022

17. Cities in Crisis: A Matter of Survival 18' C
Universal and Visual Arts
221 Park Avenue South
New York, New York 10003

18. What Are We Doing to Our World? 2 parts, each 30'
Field Service
Indiana University, A-V. Center
Bloomington, Indiana 47401

19. Air of Disaster 50' C
Public Health Service
Audio Visual Facility
Atlanta, Georgia 30333

or

Association Films
347 Madison Avenue
New York, New York

20. Beargrass Creek 19' C
Stuart Finley Productions
3428 Mansfield Road
Falls Church, Virginia 22041

21. Progress, Pork-Barrel, and Pheasant Feathers 27' BW
McGraw-Hill Contemporary Film Rental Office
828 Custer Avenue
Evanston, Illinois 60202

22. Wild Rivers 28' C
Sponsored by Humble Oil and Refining Company

23. Beyond Conception 35' C
Hank Newenhouse, Inc.
1017 Longaker Road
Northbrook, Illinois 60062

24. Population Ecology 28' BW
McGraw-Hill Contemporary Film Rental Office
330 West 42 Street
New York, New York 10036

SLIDES

Available from Denoyer-Geppert Audiovisuals

1. Investigations in Ecology: A Biological Approach
   1. Problems in Ecology
   2. Ecological Populations and Communities
   4. Material Cycles in Nature

Available from Dade County Audiovisual Center

2. Field Trips to Miami City Water Plant AV#5-20089

FILMSTRIPS

Available from Eastern Airlines Public Relations

3. Florida and the Everglades

4. Ecology of the Caribbean

SUGGESTED DISCUSSION QUESTIONS

Ten Years To Go! Bulletin 10B-SU-7 Dade County Board of Instruction (Experimental)

1. (p. 7) #5 - (General discussion of term pollution)
2. (p. 118) #3a - (Thermal pollution issue)
3. (p. 141) - "Why we use Pesticides"

Interaction Science Curriculum Project. Interaction of Man and the Biosphere. Chicago: Rand McNally, 1969.

4. (p. 115) - Death of deer who died of "nervous breakdowns"
5. (p. 276) - In Dade, what is the greatest source of water? pollution? of air pollution?
6. (p. 276) - What ideas do you have to help prevent such pollution of water and air in our area?

General

7. Should men be sterilized after two children are reached in a family? Women?
8. Should the government stop exemptions on the Income Tax after two children?
9. Examine your own attitudes about ordinary daily activities - are they good or bad for the environment?

ADDITIONAL INNOVATIVE ACTIVITIES

1. Select a pesticide issue on which a trial could be based, or make up one. (p. 141-142 - Ten Years To Go!)

2. Play the game "Extinction: The game of Ecology."

3. Write and publish a newspaper on some single topic - air pollution, water pollution, etc.; and distribute it around neighborhoods to inform the public.

4. Write a science fiction story on what life may be like in the year 2017 if the environmental deterioration continues. Use everything you can think of about pollution, population and government to give a convincing prediction of what life may be like in the future.

5. Make a mural of the water cycle. See Needham, Dorothy: "Pollution - A Teaching and Action Program" (Grade Teacher reprint) for great ideas of what to include and label in said mural.

REFERENCES

1. Frazier, Ralph P. and Smith, Herbert A. The Biological Sciences. River Forest, Illinois: Laidlaw Brothers, 1969.

2. Interaction Science Curriculum Project. Interaction of Man and the Biosphere, Experimental Ed. Chicago: Rand McNally and Company, 1969.

3. National Audubon Society. A Place to Live. New York: Educational Services National Audubon Society, 1970.

4. Needham, Dorothy. Pollution - a Teaching and Action Program. Grade Teacher Reprint, Oct., 1970.

5. McCluney, Ross. The Environmental Destruction of South Florida. University of Miami Press, 1969.

6. Ten Years To Go! Dade County Division of Instruction Bulletin #10B-SU-7 (Experimental Education), 1970.

7. Thurber, Walter A. and Kilburn, Robert E. Exploring Life Science. Boston: Allyn and Bacon, 1966.

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MASTER SHEET - DOES IT HAVE TO BE A DIRTY WORLD?

Objectives	Student Text	Supplementary References	Experiments	Films	Slides and Film Strips	Projects	Reports	Demonstrations
1	1 pp. 26-29 pp. 466-469	1 pp.486-489 6 pp.139-147 1 pp.508-513 1 pp.541-546	1, 15	1,2,3,4, 5,12,15, 16,22	1-1 1-4	6, 4	1, 5	2, 3
2	1 pp. 470-475	6 pp.4-7 1 pp.508-513 1 pp.546-550	4, 5, 13, 14, 15	6,7,9, 10,13, 17,18, 21		2	1, 5	1
3	1 pp. 476-481	6 pp.101-124	2, 6, 7, 8, 9, 10, 15	17,19, 21	?		4, 5	4
4	1 pp. 476-481	6 pp.101-124	9, 10, 11, 12	14, 20		7	4	
5				8	1-2	7	3	
6		1 pp.517-522	3	11,23, 24	1-2		2, 3	
7	1 pp. 488-492	1 pp.535-552		23		1, 3, 5	5, 6	